a) The Contractor shall perform acceptance tests specified in NFPA 13. The following tests shall be conducted, but not limited to:
   (1) Water flow tests
   (2) Main drain flow tests
   (3) Alarm and supervision tests
   (4) Flushing of supply piping
   (5) Operational tests

b) In the event that any system or component fails to meet the guarantees, and the Contractor has made such alterations and modifications, as he feels necessary to obtain the guaranteed performance, the system(s) shall be retested. The entire expense of the additional tests required demonstrating the effects of such alterations and modifications shall be borne by the Contractor. The "entire expense" shall be interpreted as all outside charges incurred during the retesting including engineering fees for witnessing or coordination of testing.

c) All final field acceptance tests shall be witnessed by representatives from the local authority having jurisdiction, insuring interest, Owner, and Engineer.

4. Test Documentation. Documentation specified in Section F of Part I of this specification shall be submitted to the Engineer within 30 days of completion of satisfactory testing.

END OF SECTION 210500

SECTION 210500 – AUTOMATIC FIRE SPRINKLER SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

1. The fire protection work covered by this section consists of furnishing all labor, materials, tools, equipment, services, and supervision required to install, test, and place in service a new automatic wet pipe fire sprinkler system and underground piping in the areas shown on the drawings. The new wet pipe sprinkler system shall include above ground pipe, below ground pipe and associated equipment for a complete operational system including the interconnection to the new fire alarm system and existing fire alarm system.

2. The work shall be as indicated on the drawings and specified herein. This work includes the design, installation, and maintenance of a new wet-pipe sprinkler system in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems (2010 Edition)),* NFPA 24, *Standard for the Installation of Private Fire Service Mains* and *Their Appurtenances (2010 Edition) and NFPA 25Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems (2011Edition).*

3. In conjunction with the installation of this work, the fire protection contractor shall install all piping tight to the building structure unless specifically allowed to be installed at lower elevations by the engineer. All piping elevations shall be indicated on installation drawings and coordinated with all other trades.

4. The design drawings associated with these specifications are conceptual in nature and are not shop drawings but serve as a reference for general pipe routing where indicated and layout, and basic system configuration. The Contractor is to provide a complete shop drawing submittal, including all information required by NFPA 13, Chapter 22. Shop drawing submittals shall indicate all pipe lengths, elevations and offsets as coordinated with all building systems.

5. Any deviations from the requirements of this specification must be acknowledged in writing with the supplier's bid offer 5 working days prior to the actual bid date to allow all prospective bidders to consider potential deviations..

6. The contractor shall provide a unit cost for each piece of equipment (sprinklers, flow switches, valves, length of piping, couplings, etc.) within the sprinkler system with the bid offer.

B. RELATED WORK

The following sections contain information relating to the work under this section:

SECTION 283110 - FIRE ALARM SYSTEM

C. QUALITY ASSURANCE

1. The development of the fire sprinkler system(s) design, calculations, and shop drawings shall be coordinated with all other trades. The design, calculations, and shop drawings shall be reviewed by the engineer and the contractor's NICET III designer.

2. All materials and equipment furnished and installed under this section shall be new and currently listed by Underwriters Laboratory (UL) or approved by Factory Mutual (FM) for the intended application, except as otherwise specified herein

3. The completion of this work shall be accomplished by a qualified responsible contractor recognized as being fully experienced in the installation of sprinkler systems. The contractor shall be licensed in the State of Kansas. The contractor shall also be capable of demonstrating five years of experience in this field as a fire protection company.
4. All work shall be done in strict accordance with NFPA 13and NFPA 24 and their appendices and other applicable federal, state, and local codes and ordinances; except as otherwise indicated on the drawings or specified herein.
5. The fire protection contractor shall notify the Engineer before any changes are made to the original design.
6. All work shall be performed by competent workers skilled in the installation of sprinkler systems.
7. The project foreman shall have a minimum of 5 years experience and be of a journeyman status. The project foreman shall be on site at all times during the construction and installation of the sprinkler system.
8. Before design and installation, the contractor shall submit to the Engineer, in writing, evidence of experience and qualifications specified herein.

D. CODES, PERMITS, AND FEES

1. The contractor shall obtain and pay for all permits, tests, inspections, etc. required by local boards that have jurisdiction over the project. All work shall be executed and inspected in accordance with all local and state codes, rules, ordinances, or regulations pertaining to the particular type of work involved. Should any changes in the contract drawings and specifications be required to conform to such ordinances, the Engineer shall be notified at the time of submitting the bid.
2. After entering into the contract, the contractor shall be held responsible for the completion of all work necessary for a complete and approved installation without extra expense to the Owner/Engineer.
3. The Contractor shall prepare any supplementary detailed diagrams or drawings that may be required by any local or state authority.

E. CONSTRUCTION SCHEDULE

1. The project shall be performed to accommodate the Owner's schedule.
2. The project shall include shop drawing submittal, all piping, sprinklers, bracing, hangers, and satisfactory completion of a 200 psi hydrostatic pressure test to verify system integrity.
3. All flushing of the underground pipe shall be witness by the engineer.

F. SUBMITTALS

1. General

   a) The contractor shall submit working drawings and product data to the Engineer for approval. Both items shall be submitted at the same time, unless specifically agreed upon by the Engineer.
   b) No work, fabrication, or installation may proceed without the contractor having received written approval from the Engineer, Owner's insuring party and local Authority Having Jurisdiction, as applicable.
   c) Any changes to or deviations from approved drawings will require re-submittal and written approval from the Engineer.
   d) The contractor shall submit 5 copies of all submittal documentation.

2. Working / Shop Drawings. The contractor is responsible for the installation of the sprinkler system installation and shall prepare and submit shop drawings as follows:

a) The minimum scale shall be 1/8-inch equals 1 foot 0 inches, clearly indicating the essential details including all specialties, concealed spaces, ventilators, and all possible obstructions.
b) Drawings shall clearly indicate all information or data enumerated in Chapter 22 of NFPA 13 for sprinkler systems.
c) Drawings shall be in developed electronically in AutoCAD Version 2004 or higher.

3. Development of the shop drawings, including hanger locations, shall be supervised by a NICET Level III or IV technician certified in automatic sprinkler system design or a registered professional engineer competent in sprinkler system design. Shop drawings shall be reviewed and sealed by the NICET Level III or IV technician. Hanger spacing and shop drawing preparation shall be performed by a minimum NICET Level II technician.

4. Material and Equipment Data

a) The Contractor shall submit to the Engineer, prior to the commencement of any work (fabrication, installation, etc.), the name of the manufacturer and the type or model of each principal item of equipment or material proposed.
b) To accomplish this, it is acceptable to provide the manufacturer's descriptive, illustrated literature of all equipment, materials and devices.
c) The submittal shall provide positive indication of the specific size and description of the equipment, material or device used on this project. In other words, the data should be site specific, deleting any reference to options that do not apply to the project.

5. Hydraulic Calculations (to be submitted with shop drawings)

a) The sprinkler contractor shall perform hydraulic calculations proving hydraulically remote areas throughout the building to size the piping for the sprinkler system.
b) Hydraulic calculations shall be performed with a computer generated program as approved by the engineer prior to submittal and on form sheets that include a summary sheet, path summary, detailed work sheets and graph showing a water supply-verses-system demand.
c) Hydraulic calculations shall be performed to include a 10 psi pressure safety factor at the connection to supply.
d) The use of smaller design areas as allowed by NFPA 13 shall not be allowed on this project. The contractor shall use a minimum of 1500 square feet for all hydraulically calculated areas. A 10 PSI safety factor shall be provided the fire sprinkler system.

6. As-built Drawings. Upon completion of the work, the contractor shall revise all drawings to agree with the construction as actually accomplished with in plus or minus 6 inches accuracy and shall stamp such drawings "As-Built." Those drawings that agree with the construction as accomplished with no changes shall be stamped "As-Built, No Change." One reproducible and one electronic copy in AutoCAD Version 2004 or higher of all as-built drawings shall be submitted to the Engineer.

7. Operations and Maintenance Manuals

a) The contractor shall furnish operating instructions outlining the step-by-step procedures required for system start-up, operation, and testing. The instructions shall include the manufacturer's name, model number, catalog cuts, diagrams, drawings, parts list and descriptive data covering the proper operation and testing of the systems.

b) The contractor shall furnish maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall reflect as-built conditions and include simplified diagrams for the system.

c) After approval of the shop drawings and not later than field acceptance testing, the contractor shall provide a list of recommended spare parts and supplies, a current unit price and a source of supply.

d) Posted Instructions.

(1) Framed instructions under glass, showing the complete layout of the entire system, shall be posted where directed by the Owner.

(2) Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely operating and shutting down the system shall be prepared in typed form and posted beside schematic drawings of the system and framed under glass.

(3) All valves located on the riser and backflow prevention assembly shall be tagged with a brass circular disk stamped with numbers corresponding with the sequence of operating instructions

(4) Proposed drawings/diagrams, instructions, and other sheets shall be posted before acceptance testing of the systems.

8. Certification and Field Test Reports

a) Hydrostatic and flush test reports shall be completed in accordance with this Specification and Chapter 24 of NFPA 13. Hydrostatic testing shall be conducted at 200 psi for a period of two hours. **NOTE**: The Contractor will utilize industry-accepted test reports (NFPA format) that provide sufficient detail on system components, tests completed, data collected and test results.

b) At least 7 days prior to requesting a final acceptance test of the fire protection system, the Contractor shall prepare and submit pre-operational test procedures that detail what is to be tested, how the tests are to be conducted and what acceptance (pass/fail) parameters for the various tests and test equipment will be required. The test report shall provide a table indicating final valve position and optimum settings on relief valves, pressure gauges, etc.

c) Upon completion of pre-operational testing, three copies of the test reports shall be submitted in booklet form detailing the tests performed, data collected, adjustments made, and any other necessary actions required to prove compliance with the specified performance criteria. Each test report shall indicate the final position of all valves and set points on pressure gauges and relief valves on wet pipe systems.

d) Tests shall be completed in accordance with this Specification. The contractor is responsible for providing all test equipment necessary in the performance of field acceptance testing

e) The engineer shall give final acceptance of the system.

G. DELIVERY, STORAGE AND HANDLING

1. All sprinkler components shall be in factory packing, inspected for damage, and comply with manufacturer's rigging and installation instructions.
2. Protect all piping, valves and associated components from physical damage, including effects of weather, water and construction debris.
3. Provide temporary inlet and outlet caps, maintain these protective caps in place until being installed or connected.
4. Storage of all materials shall be as allowed by the Owner. Space is limited and outside storage shall not be allowed without Owner approval.

H. MAINTENANCE AND WARRANTY SERVICE

1. Furnish service and maintenance of the fire protection system for a one year period from the Date of Acceptance by the Owner/Engineer of the work. Warranty service shall include all work for the referenced one-year period. All inspection, testing and maintenance and shall be per the quarterly requirements NFPA 25, 2011 Edition.
2. Contractor shall submit all reports to the Owner and the engineer during the one year period including the annual inspection report after one year of the system installion.

I. SYSTEM DESCRIPTION

1. The overall fire protection for the building shall be provided in accordance with the following general guidelines, as indicated on the drawings, and as specified herein.
2. Wet Pipe Sprinkler System. Installation of hydraulically designed wet pipe sprinkler system shall be provided as specified in these contract documents and as required in the facility by NFPA 13, including but not limited to overhead pipe, underground pipe and backflow preventer.

J. SYSTEM DESIGN

1. The wet pipe sprinkler system shall be designed in accordance with NFPA 13 – 2010 Edition. The system shall be designed to 0.1 gpm per square foot over the most hydraulically remote 1,500 square feet for light hazard areas and 0.15 gpm per square foot over the hydraulically remote 1,500 square feet for ordinary hazards areas as required by these contract documents and in accordance with NFPA 13 – 2010 edition.

   a) The use of smaller design areas as allowed by NFPA 13 **shall not** be allowed on this project. The contractor shall use a minimum of 1500 square feet for all hydraulically calculated areas. A 10 PSI safety factor shall be provided the fire sprinkler system.

2. Inspector's test connections, main drains, and auxiliary drains shall be provided in accordance with NFPA 13 and as shown on contract documents. All test connections shall be provided with a sight glass and shall discharge to a location outside the building that will accommodate full flow.

   a) Auxiliary drains shall be provided with a minimum of ¾ inch globe valve, 5/8 inch hose bibb and brass cap.

PART 2 - PRODUCTS AND MATERIALS

A. GENERAL

1. Material and equipment shall be as specified or as shown and shall be suitable for the service intended. Materials shall be new and unused, except for tests.
2. All materials and equipment furnished and installed under this section shall be listed by Underwriters' Laboratories, Inc., or approved by Factory Mutual Engineering Corporation, except as otherwise specified herein.
3. When two or more units of the same class of equipment are required, they shall be products from a single manufacturer.
4. All material and equipment necessary to meet the requirements of these codes shall be provided regardless of whether each item or device is specifically mentioned in this section or shown on the drawings.

B. PIPE AND FITTINGS

1. Aboveground Pipe

   a) Pipe used shall not be subject to a working pressure in excess of 25 percent of the hydrostatic pressure test required by ASTM A795, A53, A135 or F442, as applicable.
   b) Schedule 40 black steel pipe shall be used in all areas for pipe 1 inch thru 2 inch.
   c) Schedule 10 pipe will be allowed for 2 ½ inch and greater.
   d) All piping shall be galvanized schedule 40 with galvanized fittings for piping that goes to the exterior of the building.
   e) CPVC pipe shall not be used on this project.

2. Joints

   a) Joints shall conform to NFPA 13 and NFPA 14.
   b) Shop welded joints will be permitted.
   c) Roll-grooved pipe and fittings shall be prepared in accordance with manufacturer's latest published specification for the pipe material, wall thickness, and size.
   d) Mechanical grooved pipe joints shall conform to AWWA C606. Joints shall be made using a UL listed or FM approved combination of fittings, gaskets, and grooves. Rolled pipe grooves shall be dimensionally compatible with the fittings.
   e) Fittings for aboveground piping shall be of a type specifically approved for use in sprinkler systems.
   f) Steel or cast iron sock-it type fittings for plain end pipe shall not be allowed
   g) All piping two inches and smaller in diameter shall be threaded.
   h) The use of groove /flange adapters is prohibited from use on this project.
   i) The use of cut in mechanical tees for use of attaching branch lines to mains is prohibited from use on this project.
   j) All connections to fire sprinkler mains for branch lines shall be shop welded.

3. Reductions in pipe shall be made with one-piece reducing fittings.
4. 1 x ½ bushings shall be installed at each upright sprinkler location to maintain the 1 inch outlet for possible future remodels.

C. HANGERS AND SUPPORTS

1. Hangers and supports are the responsibility of the Contractor and shall be provided in accordance with provisions of NFPA 13, the piping manufacturer and these specifications.
2. Contractor is to review the architectural documents for areas that may require specialty hanging requirements.

D. PIPE SLEEVES

1. All penetrations through masonry walls, floors, and ceiling shall be sleeved and core drilled.
2. Where pipes pass through firewalls, fire partitions, or rated floors, a qualified fire stopping material shall be provided. The contractor shall submit to the Engineer for approval, supporting documentation that the proposed fire stopping material is UL Listed or FM approved for the type of penetration and required fire rating and the specific fire stopping assembly shall be indicted on the contractors submittal drawings for review and acceptance by the Engineer.

E. VALVES

1. Utilize valves that allow moving parts to be changed out without removing the valve from the installed position.
2. General Purpose Type: General-purpose valves shall be OS&Y gate valves or indicating butterfly valves of an FM approved or UL listed type.
3. All control and isolation valves shall be electronically supervised by the new and existing fire alarm systems.
4. Check valves shall be an FM approved and UL listed iron body bronze trimmed swing check.

F. SPRINKLERS

1. Sprinklers shall conform to the latest edition of the UL Fire Protection Equipment Directory for the required application and for upright, pendent, sidewall, or other locations as required.
2. Sprinklers shall be as specified on the drawings:
3. Clearances between deflectors and ceiling, roof decking, roof joists, electric or heating equipment, or other obstructions shall be in accordance with NFPA 13.
4. All sprinklers shall have 175 psi working pressure.

G. SYSTEM SPECIALTIES

1. Waterflow Indicators

   a) Waterflow indicators shall be vane type.
   b) Provide alarm transmitter with retard feature to prevent false alarms. The retard feature shall be adjustable from 0 to 60 seconds and must be of the instantly recycling type.
   c) Indicator can be mounted on either vertical or horizontal service.
   d) Flow switch shall not be installed in a fitting or within 12 inches of any fitting that changes the direction of waterflow.
   e) The detector must have the sensitivity setting to signal any flow of water that equals or exceeds the discharge from one sprinkler.
   f) A tapped ½-inch conduit connection shall be provided.

2. All control and isolation valves shall be provided with listed/approved tamper switches.
3. Spare Sprinklers, Sprinkler Cabinet and Wrench

   a) Provide steel, baked red enameled, sprinkler box with capacity to store a minimum of 20 sprinklers and wrench sized to sprinklers at the sprinkler riser location.
   b) For each style and temperature range required, furnish additional sprinklers, amounting to a minimum of 5 units for every installed unit.

PART 3 - EXECUTION

A. GENERAL

1. Provide a placard permanently attached to the system riser(s) indicating the hydraulic design details as indicated in NFPA 13.
2. Clearances between deflectors and ceiling, roof decking, roof joists, electric or heating equipment or other obstructions shall be in accordance with NFPA 13 and manufactures installation instructions. Close coordination is required when routing piping and locating sprinklers around equipment and structural elements.
3. Install inspectors' test connection(s) where required by NFPA 13 and approved by the Engineer.

B. FABRICATION AND INSTALLATION

1. Piping

   a) Welding shall be done in strict compliance with ASME Boiler and Pressure Vessel Code, Section IX. Welding of sprinkler pipe is not allowed on the project site.
   b) Torch cutting and welding will not be permitted as a means of modifying or joining sprinkler systems. Sprinkler piping systems shall be joined by roll-grooved fittings as allowed by these Specifications.

2. Supports
   a) All supports and hangers shall be in accordance with NFPA 13 and the pipe manufacturer's installation instructions, U.L. listing criteria and these Specifications.

3. Drain and Test Connections

   a) Provisions shall be provided to properly drain all parts of the system.
   b) System main drain, test drains, and auxiliary drains shall be in accordance with applicable sections of NPFA 13, Contract Specifications and as shown on the Contract Drawings.
   c) Direct connection shall not be made between sprinkler drains and sewers. Where possible, sprinkler drains shall discharge outside the building at a point free from possibility of causing water damage. When this is impossible, discharge may be to a sump of sufficient capacity capable of handling full flow under normal system pressure. Sump and all associated equipment shall be provided by the sprinkler contractor.
   d) Install main drain and drain piping at low points of sprinkler piping per NFPA 13, as specified herein and as shown on the Contract Drawings.

C. IDENTIFICATION AND MARKING

1. All drain and test valves provided by the fire protection contractor in accordance with this specification section shall be identified by the attachment of durable metal or plastic tags upon which the valve function or description shall be embossed/engraved.

   NOTE: Labeling and posted operating procedures shall incorporate the identification system established by the Owner/Engineer (as applicable).

2. Tags shall be bound securely to the valve by means of stainless steel wire. In all cases, the tags will be bound in such a position as to present minimum opportunity for loss and maximum visibility. In no case will the tags be attached to hand wheels.
3. Tags for instructional purposes shall be brass, 1" diameter and be machine stamped with the corresponding number as listed in the system maintenance instructions.

D. TESTING AND CLEANING

1. Cleaning shall be in accordance with NFPA 13.
2. Hydrostatic Tests and Flushing

   a) Piping shall be hydrostatically tested at not less than 200 psi for two hours.
   b) Prior to the commencement of field tests, one certified copy of the Contractor's Material Test Certificate for hydrostatic tests shall be submitted to the Engineer. All tests shall be witnessed by a representative of the Engineer.

3. Acceptance Testing